

# Abstracts of Papers by Bell System Authors Published in Other Journals

## CHEMISTRY

**The Electrical Conductivity of Fluid Selenium Up to Supercritical Temperatures and Pressures.** H. Hoshino\*, R. W. Schmutzler†, W. W. Warren, and F. Hensel, *Phil. Mag.*, 33, No. 2 (1976), pp. 255-259. The electrical conductivity of fluid selenium has been measured as a function of temperature and pressure to 1750°C and 1200 bars, respectively. The conductivity isobars exhibit strong increases to nearly metallic behavior in selenium above 1300°C at supercritical pressures. Above 1500-1600°C the conductivity isobars drop sharply toward more insulating behavior. \*Hokkaido University, Japan; † Philipps Universität, Germany.

**Excited State Bromine Atom and Molecule Reactions.** K. B. McAfee, Jr., R. M. Lum, and R. S. Hozack *J. Chem. Phys.* 64, No. 12 (June 15, 1976), pp. 5073-5076. Using a novel capillary optical reactor to shorten drastically free radical chain lengths, we have separately identified and followed substitution and photo-addition reactions of excited  $^2P_{1/2}$  and ground state  $^2P_{3/2}$  bromine atoms with propylene. Evidence for reactions of electronically excited bromine molecules ( $B^3\Pi_{0u}^+$ ) has also been obtained.

**Non-bonded vs. Bonded Interactions in  $(Ph_3P)_4Ag_2Br_2-(Ph_3P)_4Ag_4Br_4$  and its Stereochemical Analogue  $[(RS)_4Fe_2S_2]^{2-}-[(RS)_4Fe_4S_4]^{2-}$ .** Boon-Keng Teo and Joseph C. Calabrese\*, *J. C. S. Chem. Comm.* (1976), pp. 185-186. The stereochemistry of the metal-metal nonbonded dimer-tetramer pair  $(Ph_3P)_4Ag_2Br_2-(Ph_3P)_4Ag_4Br_4$  exhibits trends resembling those of the structurally analogous metal-metal bonded pair  $[(RS)_4Fe_2S_2]^{2-}-[(RS)_4Fe_4S_4]^{2-}$ , indicating that the metal atoms within each pair probably bear similar gross atomic charges.

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## ELECTRONIC AND ELECTRICAL ENGINEERING

**Continuous Room-Temperature Operation of  $GaAs-Al_xGa_{1-x}As$  Double-Heterostructure Lasers Prepared By Molecular-Beam Epitaxy.** A. Y. Cho, R. W. Dixon, H. C. Casey, Jr., and R. L. Hartman, *Appl. Phys. Lett.*, 28, No. 9 (May 1, 1976), pp. 501-503. The continuous (cw) operation at temperatures as high as 100°C of stripe-geometry  $GaAs-Al_xGa_{1-x}As$  double-heterostructure lasers fabricated by molecular-beam epitaxial (MBE) techniques has been achieved. Improved MBE laser performance was the result of the extensive efforts to eliminate hydrocarbon and water vapor from the growth apparatus. For 12- $\mu m$ -wide stripe-geometry lasers with 380- $\mu m$ -long cavities, the cw threshold currents varied between 163 and 297 mA at room temperature.

**$GaAs$  MESFET Prepared by Molecular Beam Epitaxy (MBE).** A. Y. Cho and D. R. Ch'en\*, *Appl. Phys. Lett.*, 28, No. 1 (January 1, 1976), pp. 30-31.  $GaAs$  metal-semiconductor field-effect transistors (MESFET) have been prepared by molecular-beam epitaxy. At 6 GHz a noise figure of 3 dB was obtained with a corresponding gain of 10 dB. The transconductance of the device was 28 mmhos and  $F_{max}$  was approximately 35 GHz.

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**On Solving the Transient, Conducting Slab With Radiating and Convecting Surfaces.** J. L. Milton and W. P. Goss\*, *Trans. ASME, J. Heat Transf.*, 97 (November 1975), pp. 630-631. Physical reasoning has been employed to develop stability criteria for explicit finite-difference solutions to transient conducting slabs with (nonlinear) radiating and convecting surfaces. The "derivative method" of stability analysis requires  $\partial T^{new}/\partial T^{old} \geq 0$ . The "explicit method" requires that the positive (real) root of the governing quartic polynomial be determined. Favorable comparison of the methods is reported.

## MATERIALS SCIENCE

**Effect of Hydrogen on Amorphous Silicon.** J. J. Hauser, *Solid State Commun.*, 19 (1976), pp. 1049-1051. Amorphous Si films prepared by dc sputtering in hydrogen—argon mixtures possess a high resistivity ( $\approx 10^{10} \Omega\text{-cm}$ ) similar to that of films prepared by the glow discharge decomposition of silane.

## PHYSICS

**Distribution Coefficient of P for Growth of  $\text{Ga}_{1-x}\text{Al}_x\text{As}_{1-y}\text{P}_y$  by LPE Determined Using Auger Spectroscopy.** C. C. Chang, M. B. Panish, W. R. Wagner, D. L. Rode, S. Sumski and R. G. Sobers, *J. Appl. Phys.*, 47 (1976), pp. 3752-3753. Auger spectroscopy was combined with ion milling for quantitative chemical analysis and depth profiling to measure the effective distribution coefficient of phosphorus,  $k_p$ , during growth of  $\text{Ga}_{1-x}\text{Al}_x\text{As}_{1-y}\text{P}_y$  by liquid phase epitaxy. Below  $y = 0.02$  (with  $x = 0.36$ ), and with cooling rate of  $0.1^\circ\text{C}/\text{min}$  for growth,  $k_p$  was 290 at growth temperature of  $790^\circ\text{C}$  and constant down to at least  $y = 0.002$ . This high value of  $k_p$  caused depletion of P from the growth solution.

**Implications of Radiative Equilibrium in Neoclassical Theory.** F. R. Nash and J. P. Gordon, *Phys. Rev. A, Gen. Phys.*, 12, No. 6 (December 1975), pp. 2472-2486. It is found that the description of spontaneous emission provided by the neoclassical extension of semiclassical electrodynamics, which has been given by Jaynes and his collaborators, is inconsistent with the well-secured laws of Boltzmann and Planck for conditions of thermal equilibrium.

**Nd:YAG Single-Crystal Fiber Laser: Room-Temperature CW Operation Using a Single LED as an End Pump.** J. Stone, C. A. Burrus, A. G. Dentai, and B. I. Miller, *Appl. Phys. Lett.*, 29, No. 1 (July 1, 1976), pp. 37-39. CW laser action has been obtained using as-grown single-crystal Nd:YAG fibers end-pumped by a single high-radiance LED. The fibers were 0.5 cm long and  $80 \mu\text{m}$  in diameter, and the diameter of the LED luminous area was  $85 \mu\text{m}$ . The lowest cw laser threshold was observed at a diode drive current of 45 mA.